MANAGEMENT OF RENIFORM NEMATODE IN MISSISSIPPI WITH PHYTOGEN CULTIVARS AND SEED TEATEMENT COMBINATIONS

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Abstract

In Mississippi, the reniform nematode, *Rotylenchulus reniformis*, can be a severe yield reducer. The reniform nematode, is a continuing problem for Mississippi cotton farmers as well as cotton farmers throughout the southern United States. The reniform nematode remains a major yield-limiting constraint, especially where cotton has been planted continuously and in situations where soil populations exceed the economic thresholds which are greater than or equal to 1,000/pint of soil in the spring and greater than or equal to 5,000/pint of soil post-harvest. Currently, no resistant varieties are commercially available; therefore, additional management options including seed-applied nematicides may be beneficial to manage yield-limiting reniform nematode populations. During 2021, two field trials were conducted to consider the role of integrated management practices at managing the reniform nematode. Seed treatments including a base fungicide combination as well as a seed-applied nematicides in combination with several different cotton cultivars were included for a total of 16 treatments in each trial. Soil samples were collected from each plot at pre-plant, mid-season, and harvest to assess the reniform nematode population present. One of the nematode tolerant cultivars when combined with the base treatment provided significant increase in seed cotton (lb/A), up to 41%, for Field 1 and provided the greatest yield when compared to most other cultivars with the base treatment Reniform nematode numbers on average were greater in the cultivars that only received the base seed treatment when compared to cultivars with the seed applied nematicide. Managing the reniform nematode through integrated approaches, such as with cultivar and seed-applied nematicide combinations may prove an effective alternative for cotton farmers.

Introduction

Rotylenchulus reniformis, the reniform nematode, is one of three major nematode pests in the Mississippi cotton production system. Southern cotton-growing areas including those in Alabama, Arkansas, Georgia, Louisiana, Mississippi, Missouri, and Texas have historically reported high reniform nematode infestations in field situations with continuous cotton production. In field situations where the reniform nematode population is greater than the economic threshold, significant yield reduction can be observed. In severe infestations, the reniform nematode has been reported to result in yield losses of between 30 and 40%. Populations of the reniform nematode reported to result in yield losses in Mississippi range from 1,000 reniform nematodes/pint in the spring to 5,000 reniform nematodes/pint shortly after harvest. At present, reniform-resistant cotton cultivars are not widely available. However, management considerations for the reniform nematode with the existing germplasm and integrating seed-applied nematicides may prove to be beneficial for some cotton farmers. The specific objective of these trials was to determine the benefits of cultivar and seed treatment combinations in managing the reniform nematode.

Materials and Methods

Two fields (Field 1 and 6) at the Delta Research and Extension Center in Stoneville, MS, with a history of moderate reniform nematode infestation were used in 2021. Trials were planted in a randomized complete block design (RCBD) with a split-plot constraint (cultivar; n= 8). Plots consisted of four rows of cotton (40” centers) and were 35 feet long separated by a fallow alley. Treatment combinations consisted of several seed-applied nematicide treatments in combination with cultivar tolerance. Seed treatments consisted of either a base treatment (fludioxonil + mefenoxam + myclobutanil + imidacloprid) or the base treatment + Trio (azoxystrobin/fludioxonil/mefenoxam + sedexane + BioST VPH). The BioST VPH serves as the seed-applied nematicide component. Soil samples were collected pre-plant, mid-season and approximately at harvest to assess the reniform nematode population present and determine the effects of treatment combinations on nematode populations. Nematodes were extracted from 200 cc of soil from each representative plot and numbers are presented by pint of soil. Extractions were completed by elutriation and sucrose centrifugation. Stand counts and vigor were assessed post-planting. The center two rows from each plot were machineharvested post-defoliation with a two row Case IH cotton picker outfitted with a harvest weigh cell system. All data were analyzed in PROC GLIMMIX (± = 0.5).

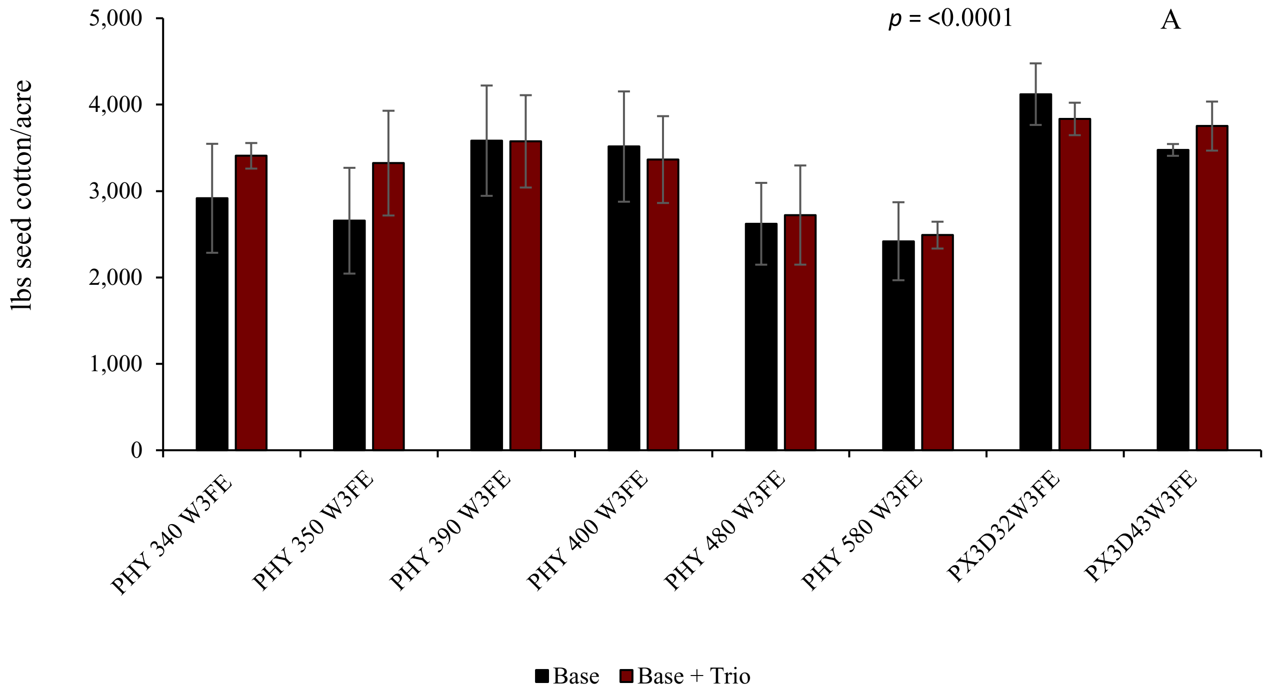
Results

No significant differences were observed between treatment combinations with regards to stand in either location during 2021; however, numerically, PHY580W3FE with the base + trio combination in Field 6 increased stand by 18% (Table 1). In most cases reniform nematode populations were above the economic threshold (1,000/pint) in the pre-plant sampling regardless of field location. Nematode populations increased during the season and were above the economic threshold (5,000/pint) by the end of the season. In general, reniform nematode populations were greater in Field 1 than in Field 6 at pre-plant; however, populations in field 6 were greater than Field 1 by harvest sampling. In addition, reniform nematode numbers on average were greater in the cultivars that only received the base seed treatment when compared to cultivars with the seed applied nematicide. In Field 1, combinations of PX3D32W3FE and PX3D43W3FE numerically reduced nematode numbers 45% and 50%, respectively (Table 1). PX3D32W3FE with the base treatment was significantly different, up to 41%, for Field 1 with regards to seed cotton (lb/A) and provided the greatest yield when compared to most other cultivars with the base treatment (Fig. 1A). In Field 1 (Fig. 1A), PHY350 W3FE, with the additional nematicide seed treatment provided significantly greater seed cotton, 20%, when compared to PHY350 with the base treatment alone.

Table 1. Percent stand establishment, and pre-plant and harvest reniform nematode (RN) numbers from a cultivar and seed treatment integrated nematode management trial conducted during 2021 at two field locations in Stoneville, MS.

		% Stand		Field 1 RN #s		Field 6 RN #s	
Cultivar	**Seed Treatment[a]**	**Field 1**	**Field 6**	**Pre-plant**	**Harvest**	**Pre-plant**	**Harvest**
PHY 340W3FE	Base	79	62	1,829	3,080	2,021	5,198 a-d
	Base + Trio	83	65	3,465	3,850	1,925	5,583 bcd
PHY 350W3FE	Base	81	59	2,888	3,850	2,021	7,796 a
	Base + Trio	86	70	2,695	2,791	2,118	6,738 ab
PHY 390W3FE	Base	79	62	2,599	3,946	1,444	6,064 abc
	Base + Trio	84	65	2,599	2,406	3,369	4,331 b-e
PHY 400W3FE	Base	85	61	2,021	4,043	1,925	5,390 a-d
	Base + Trio	87	67	2,310	4,813	963	5,390 a-d
PHY 480W3FE	Base	82	70	2,214	2,791	866	6,834 ab
	Base + Trio	80	62	1,540	3,850	2,214	7,700 a
PHY 580W3FE	Base	82	59	2,503	4,428	2,310	7,026 ab
	Base + Trio	82	72	2,503	3,369	1,348	5,005 a-d
PX3D32W3FE	Base	80	62	1,059	2,984	1,733	4,331 b-e
	Base + Trio	85	60	2,791	1,540	963	1,733 e
PX3D43W3FE	Base	82	68	2,021	2,599	2,503	3,273 cde
	Base + Trio	84	62	3,465	1,733	2,310	2,503 de
	p-value	0.9095	0.4219	0.3785	0.2196	0.1498	0.0077

[a]Base seed treatment = (fludioxonil + mefenoxam + myclobutanil + imidacloprid) and Base treatment + Trio = base treatment chemicals + Trio (azoxystrobin/fludioxonil/mefenoxam + sedexane + BioST VPH)



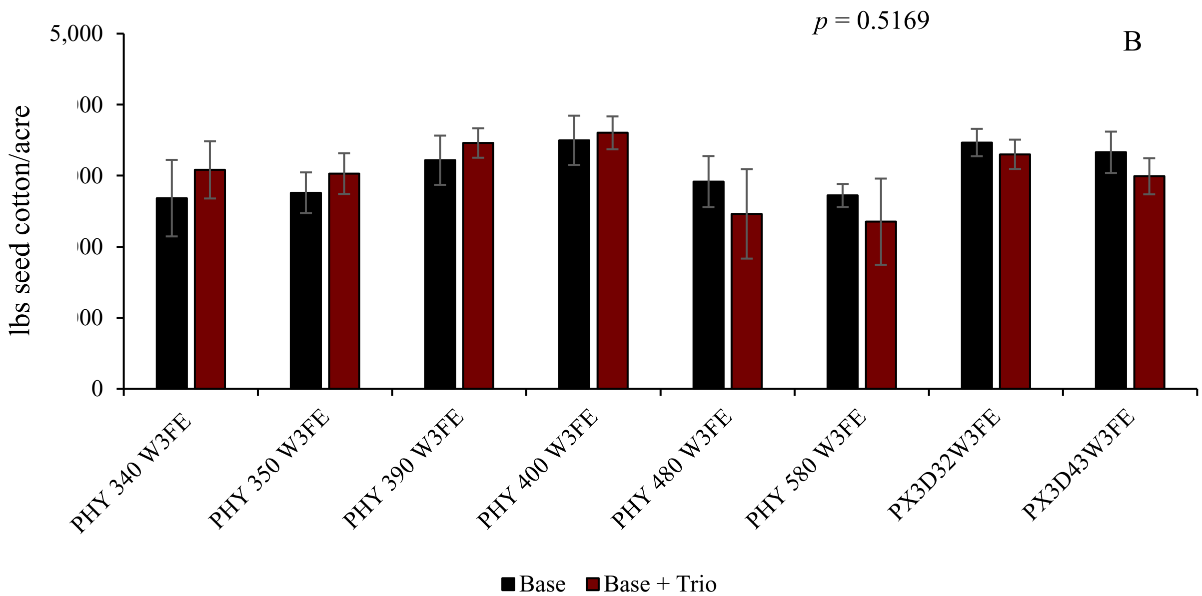


Fig 1. Yield (lbs seed cotton/A ± st. dev.) from two study sites: **A)** Field 1 and **B)** Field 6, conducted in Stoneville, MS during 2021.

Discussion

Managing the reniform nematode remains an important issue for cotton farmers throughout Mississippi. Seed treatment alone did not provide significant increases in seed cotton; however, mathematical differences observed between treatments suggest that specific seed treatment and cultivar combinations may be beneficial depending on the reniform nematode population present in a commercial field situation. With the general loss of aldicarb, and reduction in overall uses of in-furrow nematicides as a result of a reduced nematicide availability, farmers are in need of management alternatives to combat high reniform nematode populations. Seed-applied nematicides offer one of those alternatives, but these may not be attractive in situations where extremely high nematode populations are the norm. Adding management options such as with reniform nematode-resistant cultivars should greatly aid cotton farmers.

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